ATTACHMENT 2
PROCESS DESCRIPTION

Attachment 2 describes the processes, systems, and equipment that will be used in the Rapid Response System for the processing of chemical agent identification set (CAIS) and treatment of chemical agent and chemical agent-contaminated dunnage.

The Rapid Response System is composed of primarily two trailers, each with a tow vehicle. These trailers include an operations trailer and a utility trailer. The operations trailer houses a glovebox, all process equipment, and required instrumentation. Two generators, to provide prime electrical power and backup power, are carried in the utility trailer. A Mobile Analytical Support Platform (MASP) for analyzing waste and treatment residues for chemical warfare materiel and analyzing Depot Area Air Monitoring System (DAAMS) tubes for confirmation of monitoring equipment alarms and historical records is also onsite. Additional trailers will be used to house support equipment and administrative offices. The treatment reagents are discussed in Attachments 2 and 4.

The primary generator allows the Rapid Response System to operate without requiring external electric power. However, commercial or host facility electric power will normally be used. At Deseret Chemical Depot, the Depot power will be used for the Rapid Response System Test. The backup generator is capable of powering critical monitoring and ventilation equipment in the operations trailer if the primary power supply is interrupted. A third unit, an uninterruptible power supply, will maintain continuous, short-term (approximately 15 minutes) power to the critical electronic systems in the operations trailer in the event of a total power failure.

In the operations trailer, the glovebox is composed of three closed stations in which the Rapid Response System operators can unpack CAIS components, identify and segregate the components, and treat the chemical agents. The glovebox is equipped with transparent windows and sealed gloves to separate the operators from the CAIS components. In addition, a carbon filter system is located at the exhaust of the glovebox to filter all process air exiting the glovebox. Monitoring instruments are provided to analyze air samples, and a Raman spectrophotometer system can assist in the identification of chemical components. A forklift truck provides the operators a safe and secure method to lift and move CAIS overpacks and hazardous waste drums.

The treatment to be permitted in this application is the chemical oxidation of chemical agents in the Rapid Response System glovebox and treatment of certain neutralents and contaminated dunnage within the liquid waste drum and the drum for solids.

Rapid Response System operations consist of seven operational steps:

1. Moving the CAIS item from an interim storage facility to a location adjacent to the Rapid Response System loading system by Deseret Chemical Depot personnel;
2. Loading the CAIS item into the operations trailer and moving it into the glovebox;
3. Unpacking the CAIS items;
4. Identifying, segregating, and storing CAIS chemical agents and industrial chemicals;
5. Repacking industrial chemicals;
6. Treating sulfur mustard, nitrogen mustard, and lewisite agents in an enclosed reactor; and
7. Removing hazardous waste drums from the waste containerization system under the glovebox.

Recovered CAIS items currently stored at Deseret Chemical Depot have been repackaged from their original casings. There will be four configurations of CAIS that the Rapid Response System will process: (1) CAIS repackaged into PIGs, which are steel, pipe-like containers; (2) CAIS packaged in single round containers (SRCs); (3) loose CAIS ampules and bottles that may be packaged into metal or fiberboard cans and then inserted into a PIG; and (4) loose CAIS ampules and bottles that may be individually packaged into an overpack surrounded by packing material. At Deseret Chemical Depot, most CAIS components are packed in PIGs.

All CAIS items transferred to the Rapid Response System Site Supervisor for processing will be monitored for mustard and chloroform. The Rapid Response System Site Supervisor will not accept a leaking PIG or other leaking overpack. Deseret Chemical Depot personnel will be responsible for containing any leaks before transfer to the Rapid Response System and preparing the CAIS items for proper transfer to the Rapid Response System site.

The Tooele Army Depot (TEAD) Ammunition Equipment Directorate (AED) (the designer and fabricator of the Rapid Response System) has conducted a series of engineering tests to ensure that the various system components are effectively integrated and that the system as a whole performs as designed. These tests were conducted at TEAD.

The Rapid Response System test, culminating in treatment of the CAIS items stored at Deseret Chemical Depot, will be conducted in five phases:

- *Phase I: Pretest Inspection and Verification.* The Rapid Response System has been inventoried and inspected. AED engineers and technicians assisted the Rapid Response System operator's staff in demonstrating that each component of the various systems operates as designed. Instrument calibration has been performed by the Rapid Response System operator. Phase I data provides a baseline for the system being tested.

- *Phase II: Setup/Training/Initialization.* Routine, non-routine, unexpected, and emergency operations will be addressed. Exercises are being conducted with SETH, which consists of simulated K941 and K951 CAIS items filled with water overpacked in PIG containers and SRCs. The Rapid Response System Site Supervisor is conducting training to maintain crew proficiency in Rapid Response System operations. Simulated equipment test hardware (SETH) operation will also be conducted to expand the database for characterizations of Rapid Response System performance. This phase will conclude with the conduct of baseline monitoring required for actual operations, and follow-on crew proficiency training and exercises.

- *Phase III: Pre-operational Survey.* This phase is a formal evaluation by the Program Manager for Chemical Disposal (PMCD) to assess and validate the readiness of the equipment, personnel, manuals, and procedures to safely process actual CAIS materiel. The evaluation will be performed using SETH materiel and will cover routine, non-routine, and emergency operations; equipment failures; chemical materiel monitoring situational alarms; loss of power; or other situations at the option of the evaluation team. This phase will end either with PMCD authorization for the Rapid Response System to process CAIS materiel or a return to Phase II and a subsequent re-evaluation. The Permittee shall notify the Division of Solid and Hazardous Waste prior to any pre-operational exercises.

- *Phase IV: Operations with Chemical Agent Identification Set Materiel.* This phase will begin after a PMCD and Deseret Chemical Depot assessment, in coordination with the UDSHW, that the Rapid Response System is safe for conducting operations with actual CAIS materiel. Approval will be granted to commence operations with CAIS items. All CAIS materiel in storage at Deseret Chemical Depot will be processed, and all hazardous wastes will be transferred to an approved hazardous waste treatment, storage, and disposal facility (TSDF).

- *Phase V: Rapid Response System Close-Out Activities.* This phase will include maintenance, shutdown, and closeout of the Rapid Response System, storage of all equipment and supplies, transfer of all hazardous waste to a hazardous waste TSDF, and movement of the Rapid Response System from Building 4553.

2-1 CONTAINERS [40 CFR 270.15; R315-3-6(a)(1)

No permitted container storage is addressed in this permit.

The drums for liquids and solids will be conspicuously numbered when they are placed under the neutralization and unpack stations, respectively, to begin collecting the treatment residues and dunnage. Hazardous waste labels will be affixed upon the drums at the time the drums are removed from the drum drawers.

2-2 MISCELLANEOUS UNITS [40 CFR 264.601 and 270.23; R315-3-6(a)(8) and R315-8-16]

2-2a Description of Miscellaneous Units [40 CFR 270.23(a)(1) and 270.23 (a)(2)]

The glovebox, located in the Rapid Response System operations trailer, will be used to unpack, characterize, sort, monitor, repackage, and chemically treat wastes. The types of wastes that will be treated inside the glovebox are described in Attachment 4. Floor plans of the Rapid Response System operations trailer are provided in Figures 2-1 and 2-2.

The Rapid Response System has been designed, developed, and assembled by the TEAD AED. AED has conducted a series of acceptance and systemization tests that confirmed that the Rapid Response System has been built as designed, that each subsystem and component functions in accordance with design specifications, and that the glovebox is fully integrated with other Rapid Response System systems.

The Rapid Response System will be transported by the tow vehicles to the test site for operation. The Rapid Response System test will be conducted within Building 4553. The utility trailer will remain outside of the building. The utility trailer will be connected to the operations trailer by all necessary cables and wiring. A diagram of the utility trailer is included in the Rapid Response System engineering design package as drawing number AE95-RRS-210-01.

The Rapid Response System maintains employees that fill the following positions: Site Supervisor, Glovebox Operator, Monitoring Specialist, Raman Operator, Site Safety and Health Officer, Maintenance and Supply Officer, Site Administrator, Data Entry Clerk, Chemist, and Laboratory Technician. All Rapid Response System operations staff are cross-trained, where possible, to permit rotation to all duty positions.

2-2a(1) Physical Characteristics

The Rapid Response System glovebox is an enclosed structure within the operations trailer. The operations trailer is constructed of an 0.040-inch aluminum exterior skin, injected foam insulation (R14), and 3/8-inch plywood interior with 0.070-inch fiberglass reinforced plastic coating.

The layout of the glovebox is provided in Figure 2-3. The glovebox is constructed of 11-gauge type 316L stainless steel with single wall construction to allow for maximum interior space. The glovebox is located against the side of the operations trailer and is contiguous with the loading area outside the rear of the operations trailer. The glovebox consists of three separate stations: the airlock station, unpack station, and neutralization station. Chemical agent treatment occurs within the neutralization station. Treatment of contaminated dunnage may occur in either the unpack or neutralization station. The glovebox system is directly coupled with the waste containerization system and carbon filter system.

All interior materials of the glovebox are 316L stainless steel. The bottom of the glovebox stations is constructed of 0.187-inch thick 316L stainless steel. All materials of construction for the glovebox are compatible with all chemicals contained within the glovebox at any given time.

The glovebox frame is constructed of carbon steel square tubing with all welded construction and is painted with chemical-resistant Epoloid paint (or equivalent) in accordance with manufacturer instructions. The leg and mounting pad locations allow attachment to prepositioned mounting pads in the operations trailer. The total frame weight does not exceed 600 pounds.

The bottom of the glovebox stations is not sloped, and none of the stations contain a drain. The glovebox is designed with a lip surrounding the opening for the liquid waste drum and the drum for solids to prevent any uncontrolled entry of liquid into either waste drum. This design can also contain all liquid spills within the unpack and neutralization stations and can be cleaned by a glovebox operator.

The total dimensions of the glovebox is 224 inches long, 32 inches wide, and 75-1/2 inches high, while sitting 36-1/4 inches off the floor of the operations trailer.

Each glovebox station contains gloveports and a viewing window. Viewing windows are constructed of Lexan® polyacrylate and sealed in accordance with standard methods used by the glovebox industry to provide for a liquid-tight seam between the window and the glovebox. Viewing windows are constructed to allow for 8-inch diameter gloveports. The gloveport gloves are 32 inches long by 0.030 inch thick and are constructed of butyl rubber. Table 2-1 lists the dimensions of the glovebox.

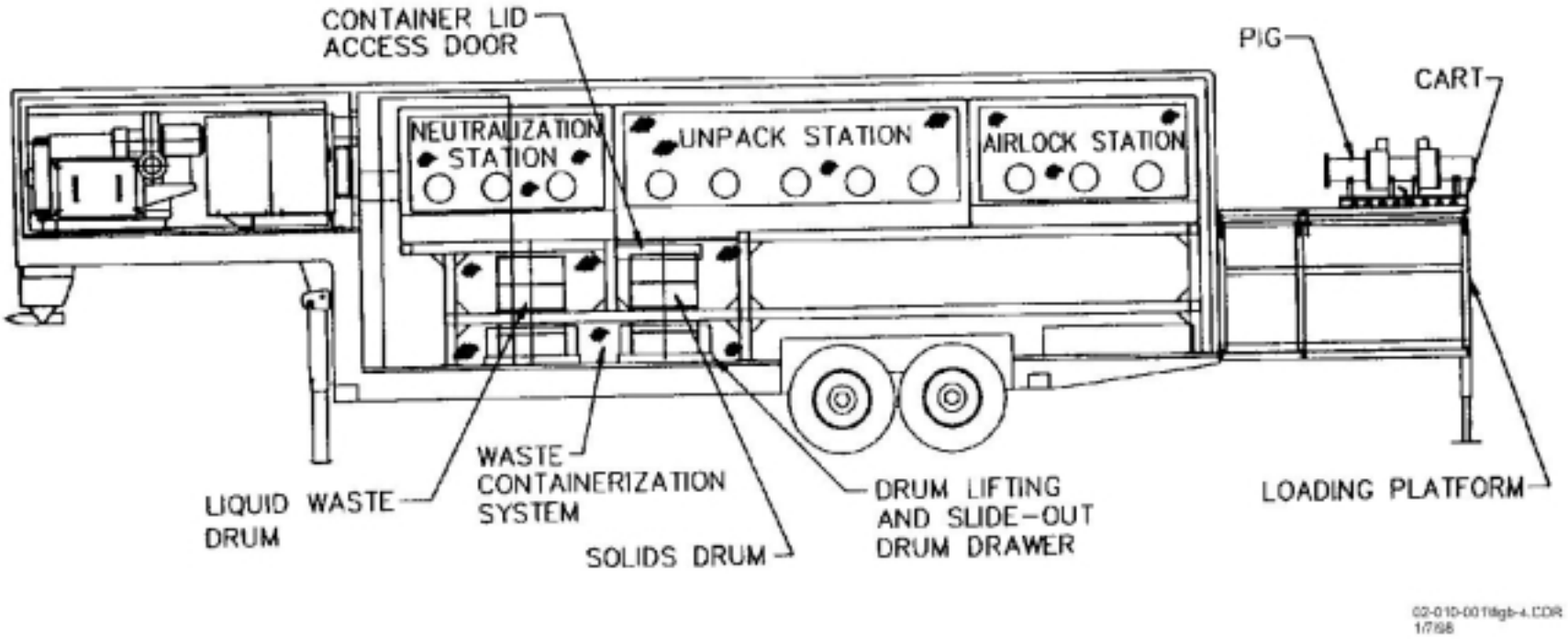

Figure 2-1
Side View of RRS Operations Trailer Showing the RRS Glovebox and Waste Drums

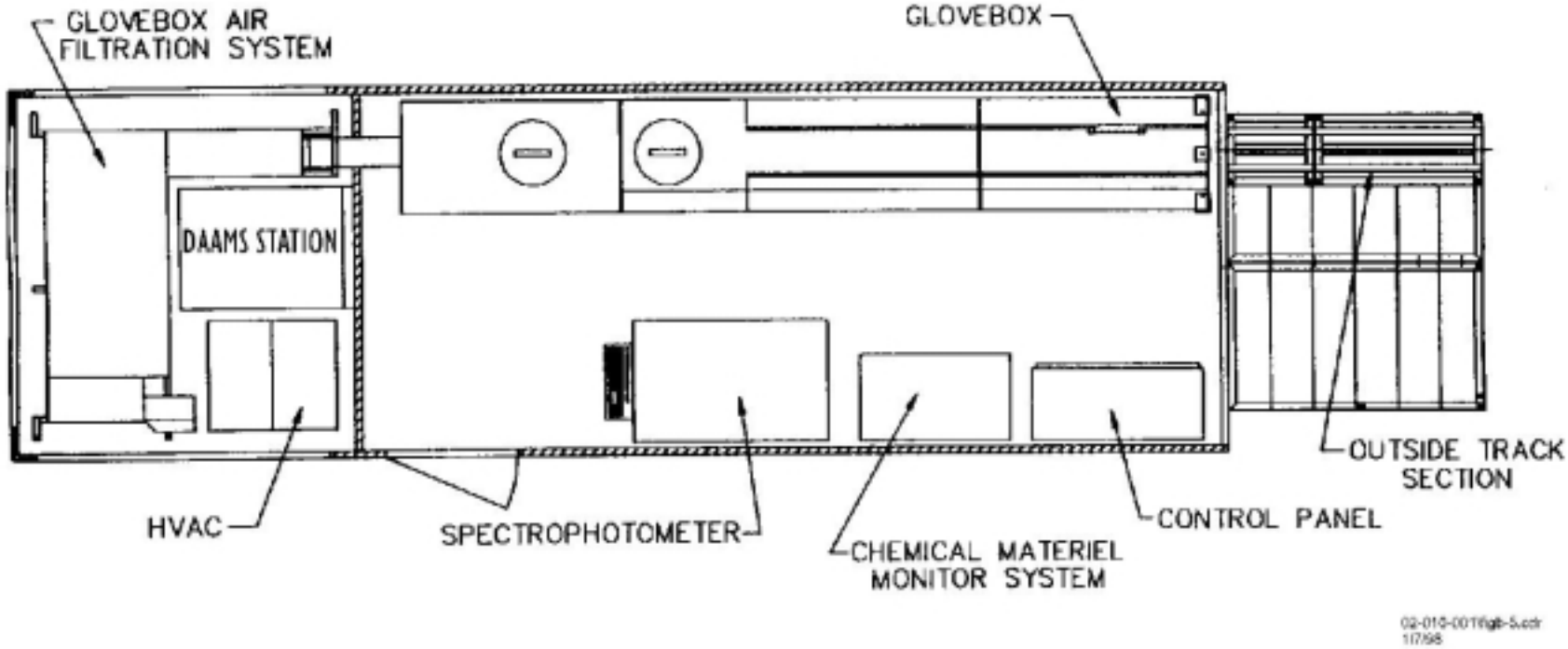

Figure 2-2
Top View of RRS Operations Trailer Showing the RRS Glovebox and Other Components

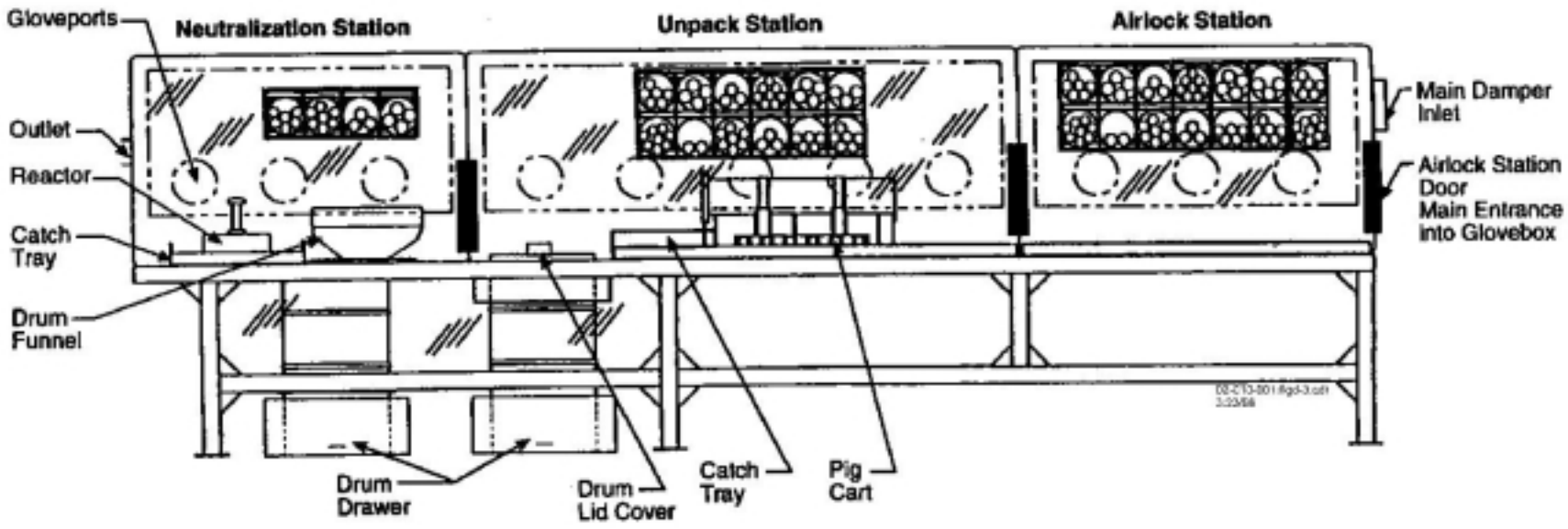

Figure 2-3
Glovebox Layout

Table 2-1.
Glovebox Dimensions

Glovebox Station	Length (inches)	Bottom Width (inches)	Number of Gloveports	Length of Viewing Window (inches)
Airlock Station	64	32	3	58
Unpack Station	100	32	5	94
Neutralization Station	60	32	3	54

The lighting for the glovebox is mounted outside on top of the glovebox structure to allow the light to shine through the transparent Lexan® panels, illuminating the interior with minimal reflective glare to the operator. The fluorescent lights are wired to an on-off switch; all electrical wiring was done in accordance with the National Electrical Code.

There are four doors within the glovebox system: one exterior door between the loading system and airlock station exterior door, one located in the rear door of the operations trailer that seals the entrance to the airlock station from outside the loading area; one between the airlock station and the unpack station; and one between the unpack station and the neutralization station. The three doors within the glovebox are 18 by 22 inches, made of 316L stainless steel, gasketed, and are completely removable. The latching device for these same two doors is operable with one hand.

The inner door for sealing the airlock is constructed of aluminum and is held in place with a bar that spans the opening. The bar is held in place by hand-tightening a screw knob in the center of the bar. The airlock access door, located in the rear door of the operations trailer, is 19 by 23 inches, constructed of stainless steel, hinged to swing to the outside of the trailer, and also latched with a one-hand-operable device.

During operations, the glovebox is continuously ventilated by exhausting air through a carbon filter system. The filtered exhaust from the Rapid Response System will be exhausted inside of Building 4553. The heating, ventilation, and air conditioning (HVAC) system controls relative humidity and maintains a comfortable temperature for the operators in the workspace. Make-up air enters the operations trailer through a manually adjusted vent in the HVAC inlet duct to replace the air exhausted through the carbon filter system. The air ventilation inlet damper on the end wall of the airlock station admits fresh air into the glovebox. A diagram of the carbon filter system is included in the engineering design package for the Rapid Response System as drawing number AE95-RRS-520-01. The filter elements that compose the air filtration system at the end of the glovebox are a prefilter, two high efficiency particulate air (HEPA) filters, two coconut shell carbon filters for specific control of chloroform, and two ASZM-TEDA carbon filters for control of chemical agents.

An induced draft fan maintains the glovebox at a minimum of 0.25-inch water column negative pressure as measured at the unpack station. The operating pressure will be maintained during Rapid Response System operations to ensure that the negative pressure does not go below 0.25-inch water column during operations such as opening the airlock door, changing drums, or changing gloves. This fan pulls air through the glovebox to the bank of redundant carbon filters. There are air ventilation holes between the airlock and unpack stations with passive damper doors.

A bag-in-bag-out procedure is used for filter changeout of all the filters in the carbon filter system. All filter elements are removed from the exterior filter housing while remaining contained in a plastic bag, preventing exposure of personnel and the environment to the contents of the spent filters.

The CAIS item loading system consists of a cart transfer mechanism, constructed of stainless steel, and is used to transport the CAIS items and overpacks through the airlock station into the unpack station. There are three different carts for loading CAIS into the Rapid Response System at Deseret Chemical Depot: a PIG cart for loading CAIS PIGs, an SRC cart for loading PIGs in SRCs, and a box cart for loading loose CAIS components or other required items or equipment. The appropriate cart will be positioned on the end of the cart track outside the operations trailer where it can be loaded (see engineering design drawing number AE95-RRS-210-01). The track runs along the floor of the glovebox through the airlock and unpack stations. The track support angles for the cart transfer mechanism are sized to support a maximum weight of up to 300 pounds. A diagram of the cart transfer mechanism is included in the engineering design package for the Rapid Response System as drawing number AE95-RRS-600-01.

There is a gloveport within the airlock station that may be used as a pass-through port where tools, holding cans, etc., can be admitted into the glovebox while still maintaining adequate negative pressure.

Special tools are required within the glovebox stations to accomplish the Rapid Response System mission. A pipe cutter is used to cut open a PIG. PIGs of a certain length (42 inches) may be opened manually but must be cut with the pipe cutter to fit into the 30-gallon drum for solids. The industrial pipe cutter uses a collar and cutting tool to attach around the PIG. A drive motor attaches to the collar to drive the cutting tool.

For CAIS components in cans inside PIG containers, a can-auger and can-pusher can be used to free the cans from the PIG. The can-auger is a hand-powered device for agitating the cans until they break free. Extensions attach to the end of the can-auger and allow it to reach further into the PIG. A can-pusher pushes the cans from the severed section of the PIG.

Once CAIS materials have been removed, they will be segregated and held in color-coded cans in a holding rack until processed. The holding racks will be located in all three glovebox stations. Bottles will be held in bottle mailing tubes inside cardboard holding cans. Ampules will be held in ampule mailing tubes inside cardboard holding cans. All holding cans will be color-coded to aid in positive segregation of CAIS components.

Ampules whose contents cannot be identified visually during segregation will be held in a separate holding can located in the unpack station of the glovebox until their contents can be analyzed. These unknown ampules will be segregated using the Raman spectrophotometer in the unpack station of the glovebox. The Raman spectrophotometer will nonintrusively identify the contents of ampules and provide the results in the form of a spectrum. Since the Raman spectrophotometer cannot be used to identify charcoal-containing CAIS bottles, generator knowledge will be used to identify these CAIS items. All charcoal-containing CAIS bottles are marked with the identity of the vesicant adsorbed onto the activated charcoal.

Stainless steel catch trays are used in the unpack station to contain extraneous solids and/or liquids spilled. Treatment of contaminated packing materials and miscellaneous dunnage will occur when there is an identified spill of chemical agent that occurred previously within the PIG or during unpack operations. A stainless steel catch tray is located under the reactor in the neutralization station of the glovebox to provide primary confinement for liquids should they escape from the reactor. A diagram of the catch trays is included in the engineering design package for the Rapid Response System as drawing number AE95-RRS-310-01.

The treatment process occurs in a reactor located in the neutralization station of the glovebox. A diagram of the reactor is included in the engineering design package for the Rapid Response System as drawing number AE95-RRS-400-01. The inside dimensions of the reactor are 8.25 inches in diameter by 5 inches high. The reactor is constructed of 316L stainless steel and has a nominal capacity of 1 gallon. The reactor consists of the reactor itself, a lid, a crushing mechanism, a keeper ring, a rupture disk, and a pressure release valve. During this test, a pressure transmitter has been installed in the lid, as well as a temperature transmitter in contact with the reactor. Once chemical agent and treatment reagent have been loaded into the reactor, the lid will be sealed to the reactor and then the pressure release valve will be closed. The keeper ring will lock the crushing mechanism in the raised position until needed; the lock will then be released. The glovebox operator will exert pressure on the crushing mechanism to break the glass ampules or bottle in the reactor and initiate the neutralization of the agents. The crushing mechanism is used to agitate the mixture within the reactor by turning it clockwise. The reactor contents are emptied into the liquid waste drum via a funnel screwed to the drum bung. This funnel will also support the reactor while it is being emptied (see engineering design drawing numbers AE95-RRS-400-07 and AE95-RRS-400-08).

The liquid hazardous waste drum and the hazardous waste drum for solids will be part of the waste containerization system. This system is composed of two independent enclosed compartments that hold the waste drums under the neutralization and unpack stations of the glovebox, respectively.

The liquid hazardous waste drum is used to containerize, treat, and transport Rapid Response System treatment residues. The liquid hazardous waste drum collects waste generated from the treatment process. Some of the treatment residues may be corrosive; therefore, a 30-gallon phenolic/epoxy-lined steel drum is used to effectively contain these chemicals.

The hazardous waste drum for solids, while still within the engineering controls of the Waste Containerization System, may be used to treat contaminated dunnage in a non-routine situation. This drum has a capacity up to 30 gallons and is phenolic/epoxy-lined steel.

The drums are loaded into the drum drawers of the waste containerization system and lifted by electric actuators to form a seal with the neutralization station or unpack station of the glovebox (see engineering design drawing number AE95-RRS-500-01). The liquid hazardous waste drum and the solids drum will be sealed by a gasket into the glovebox until such time as the process solutions change or the drums are full.

The glovebox structure, including the three glovebox stations, external support stands, reactor, lid, funnel, cart transfer mechanism, catch trays, can auger, can-pusher, drum opening lids, and waste containerization system, have been custom-designed and fabricated. All other glovebox equipment is commercially available.

2-2a(2) Operation and Maintenance

The treatments to be conducted within the reactor will chemically oxidize the CAIS chemical agent components [mustard (H), distilled sulfur mustard (HD), bis(2-chloroethyl)ethylamine (HN-1), tris(2-chloroethyl)amine (HN-3), or lewisite (L)].

After being loaded onto the appropriate cart transfer mechanism, the CAIS items enter the operations trailer and glovebox. Once CAIS materiel enters the glovebox, it is considered "in process" and will remain in the glovebox until treated or overpacked for shipment offsite to an approved TSDF. Items confirmed as non-CAIS items are returned to storage or held in the glovebox for neutraliztion or repackaging, as appropriate.

Airlock Station. The first station the CAIS materiel must pass through is the airlock station. The operators inside and outside the operations trailer open the sealed door of the airlock station and secure it. After CAIS materiel enters the airlock station, the door will again be sealed. Adequate time for the negative pressure in the airlock station to be restored is allowed before the door between the airlock and the unpack station is opened.

Unpack Station. The second station the CAIS materiel must pass through is the unpack station. In the unpack station, CAIS materiel is unloaded and segregated by category.

Most CAIS materiel will be packaged in PIG containers. There will be two sizes of PIGs used to contain CAIS: the long PIG, which is 38 to 42 inches long, and the short PIG, which is 23 inches long (see Attachment 4 Appendix 1 for more detailed information on PIGs and CAIS components). All PIG containers will be accessed by removing the flange blank or by cutting the PIG open with the PIG cutter. The contents of the PIG will then be manually removed. The long PIGs will be cut twice with the PIG cutter to enable them to fit into the hazardous waste solids drum.

Once opened, PIGs containing cans of bottles and ampules will be carefully removed from the opened PIG and set into a catch tray. All packaging material from the PIGs, usually including pieces of the PIG, are placed into the solids drum under the unpack station.

In cases where the CAIS components are packaged in an overpack, the overpack will be delivered through the airlock to the unpack station, accessed, and the contents manually removed.

Once all CAIS components have been removed from their overpack and all extraneous packing material is appropriately discarded, the cart transfer mechanism is returned to the airlock station and monitored with MINICAMS® for contamination. Once the cart transfer mechanism is cleared by monitoring, it is moved to the loading area outside the operations trailer.

The initial identifying and segregating of the CAIS ampules and bottles is accomplished visually in the unpack station as the items are removed from their packing materials.

CAIS components stored in bottles should have chemical markings etched or painted on the outside of the container. Ampules are not expected to have identifying markings. All ampules and bottles are then placed into mailing tubes with a unique tracking number.

The contents of the ampules will be identified by the Raman spectrophotometer identification system. Criteria for identifying ampules for treatment in the neutralization station is as follows. All containers positively identified as containing chemical agent (H/HD, HN-1, HN-3, L) will be treated. All CAIS ampules positively identified as containing chloroform in the absence of chloropicrin will be treated. All ampules positively identified as containing industrial chemicals will be repackaged for shipment to an approved hazardous waste TSDF. All other ampules/bottles will be considered unknown. Handling of these components is discussed in Appendix 2-2, Unexpected Operations.

The Raman spectrophotometer identification system consists of an imaging spectrograph and a low-noise, charge coupling device detection system. Both a continuous-wave, Nd:YAG laser and a "red" near infrared continuous-wave diode laser provide appropriate light to excite the sample. The sample produces wavelength shifts measured by the spectrophotometer to produce a spectrum. Specially designed, flexible, fiber-optic cables conduct the light from the laser and return the shifted light back to the spectrophotometer. The instrument processes the resultant changes in the light and displays a Raman spectrum on a PC computer system. The spectrum is also produced on a laser printer. A hard copy of the identifying Raman spectra will be maintained in the Rapid Response System operating record. Attachment 2-1 contains more detailed information on the operation of the Raman spectrophotometer. The Raman spectrophotometer identification system is operated by personnel with specialized training in Raman spectrophotometer operation and applications.

Once the contents of each CAIS ampule and bottle have been assessed, they are separated into color-coded holding cans and maintained in the holding racks on the back walls of all three glovebox stations. Industrial chemical CAIS items may be maintained in the unpack and airlock stations of the glovebox. The industrial chemical CAIS will be maintained in their original sealed/closed glass bottles or ampules. Maintaining industrial chemical CAIS in this manner precludes the possibility of industrial chemical CAIS becoming contaminated with chemical agent.

All CAIS materiel is maintained in holding cans within the glovebox. However, only the CAIS chemical agents will be treated; the remaining industrial chemicals are repackaged into lab packs and sent offsite to an approved TSDF.

Table 2-2 lists the appropriate color codes of the CAIS chemical agents to be treated. RED, BLACK AND WHITE STRIPES, BROWN, and BLUE color codes indicate the four different treatment processes that occur within the neutralization station of the glovebox.

The holding can containing the CAIS chemical agents is moved into the neutralization station and placed in the temporary holding racks.

Neutralization Station. Treatment operations are performed in the neutralization station of the glovebox. There are four separate treatment processes: a RED process, CHARCOAL process (BLACK AND WHITE STRIPES), CHARCOAL L process (BROWN), and BLUE process.

- The RED process will treat the H, nitrogen mustard (HN), and L agents in chloroform ($CHCI_3$) solution contained in ampules of the K951 through K954 sets. The Raman spectrophotometer will indicate CAIS materiel containing $CHCI_3$ but may be unable to identify the chemical agent due to degradation. This CAIS materiel will be treated in the RED process, given the absence of chloropicrin (PS). PS was packed as a 50 percent solution and is expected to be readily identified by the Raman.

- The CHARCOAL process will treat H and HN adsorbed onto charcoal contained in bottles of the Navy K955, X302, X547, X550, and X551 sets.

- The CHARCOAL "L" process will treat L adsorbed onto charcoal contained in bottles of the Navy K955 and X548 sets.

- The BLUE process will treat neat H contained in bottles of the K941 and K942 sets.

Table 2-2.
CAIS Color Codes

Color Code	Contents	Chemical Materiel
RED	Ampules only	Sulfur mustard (H/HD), nitrogen mustard (HN-1), or lewisite (L) in chloroform ($CHCl_3$) solution
BLACK AND WHITE STRIPES (CHARCOAL)	Bottles only	Sulfur mustard (H/HD), nitrogen mustard (HN-1, HN-3) adsorbed onto activated charcoal
BROWN (CHARCOAL "L")	Bottles only	Lewisite (L) adsorbed onto activated charcoal
BLUE	Bottles only	Neat sulfur mustard (H/HD)

The RED and BLUE, CHARCOAL or CHARCOAL L treatment processes are conducted separately. Each will be completed prior to processing any other chemical agent reactions. CHARCOAL and CHARCOAL-L treatment residues will not be combined in a waste container. Data on the effectiveness of these treatment processes can be found in the following documents, which have been issued to UDSHW under separate cover:

- Dichlorodimethylhydantoin Treatment of Chemical Agents in Chloroform (Red Process), Final, June 1997;

- Dichlorodimethylhydantoin Treatment of Sulfur Mustard (Blue Process), Final, June 1997; and

- Dichlorodimethylhydantoin Treatment of Chemical Agents on CHARCOAL (CHARCOAL and CHARCOAL-L Processes), Final, June 1997.

The neutralization station will, in most cases, require the following equipment to effectively treat chemical agents:

- Reactor with reactor lid;
- Pressure release tube and valve;
- Solvent mixtures and reagent in pre-measured containers;
- Reagent;
- Drum funnel;
- Catch trays;
- Squeeze bottle with water;
- Rubber spatula;
- Absorbent pads;
- Towels;
- Reactor lid seal wipes; and
- Waste pail.

RED Process. The RED process will treat the H, HN, and L agents in $CHCI_3$ solutions (ampules only). The treatment reagent for the RED process will be a mixture of 1,3-dichloro-5,5-dimethylhydantoin (DCDMH) and solvent (48.5 percent $CHCI_3$, 48.5 percent t-butyl alcohol, and 3 percent water). The DCDMH and the solvent will be mixed after they are placed into the reactor. The DCDMH will be tested for available chlorine every six months. The operator will verify that the DCDMH is in date before use. The solvents do not have a shelf life and, therefore, do not require dates.

The ampules containing the chemical agent to be treated by the RED process will be contained in RED process color-coded holding cans.

If there are any holding cans other than the RED process color-coded holding cans in the neutralization station, they will be moved back into the unpack station temporary holding racks.

Once all the required RED process equipment and materials are on-hand, the RED treatment process begins by positioning the reactor in a catch tray to provide spill control. The reactor lid will be removed and placed in a catch tray. The reactor lid will then be checked by the neutralization station operator to ensure that the crusher is in the raised position and that the pressure release valve is closed.

Ampules will be loaded into the reactor one at a time. The reactor will hold a maximum of three CAIS ampules. The RED process solvent and reagent will then be poured into the reactor.

The reactor lid will then be positioned on the reactor and sealed as quickly as possible. This will be done to limit the amount of chloroform vapors released into the neutralization station.

The keeper ring that secures the crusher in the raised position will be released, allowing the crusher to be lowered into the reactor to its fully lowered position. The operator will exert pressure on the top of the crusher with sufficient force to break the ampules.

The neutralization station operator will use the crusher handle to agitate the mixture of chemical agents and treatment reagents by periodically rotating it clockwise. The treatment reaction is expected to be very rapid, requiring only a few minutes to run to completion. However, neutralization station operators will allow 15 minutes for completion of the reaction to add a substantial safety margin to operational procedures.

During the remainder of the process, the operators will observe, announce, and record the reactor temperature. If the temperature exceeds 120^0F, the operators will remove their hands from the glovebox and advise the Rapid Response System Site Supervisor. The procedure may continue after the temperature falls below 120^0F.

At the conclusion of 15 minutes, the operator will record the temperature of the reactor from the thermometer on the reactor. The reactor temperature must be below 120^oF to allow safe handling. Once ensuring that the reactor temperature reads below 120^oF, the operator will place the end of the pressure release tubing into the drum funnel to direct any liquid spatter into the drum. Then the operator will slowly open the relief valve to vent any pressure from the reactor.

With the pressure released, the pressure release valve will be turned clockwise to close the valve and the pressure release tubing will be removed from the drum funnel. The reactor lid will then be opened, carefully removed from the reactor, and placed in a catch tray. The reactor will then be moved to the drum funnel assembly. The reactor will be slowly tilted and the contents poured into the funnel. Care will be taken to limit the spill or splash of liquid treatment residues and/or broken glass pieces outside of the drum funnel. If required, a rubber spatula will be used to help remove all glass pieces from the reactor. If another RED process is to be repeated, the reactor lid seal will be wiped off with a small pad and the reactor positioned back in the catch tray for loading again. If the RED process is complete or operations are stopping for the day, the reactor will be cleaned as described below. After cleanup, RED process solvent containers will be disposed of in the solids drum.

Care will be exercised to avoid spreading the liquid treatment residues, broken glass pieces, solvent, or water during cleanup and housekeeping operations. To the extent possible, all liquids will be confined to the open top of the drum funnel, and creation of solid waste will be kept to a minimum. Both the reactor and reactor lid will be cleaned separately over the drum funnel by rinsing with RED process solvent followed by water to remove all treatment residues and pieces of broken glass. A small amount of detergent may be added to the rinse water to provide surfactant properties. Any material remaining attached to the reactor or lid will be manually wiped off with a towel.

All spent cleanup materials generated during the treatment process will be placed in a waste pail as they are created (reactor lid seal wipes, absorbent pads, used towels, etc.).

If the next process is not a RED process, the liquid hazardous waste drum will be removed according to the procedures described in this section under "Removing the Hazardous Waste Drums."

Upon successful completion of the above steps, 50 milliliters (mL) of the treatment residue will be withdrawn and sent to the MASP for chemical agent screening. If requested by UDSHW or the receiving TSDF, additional samples of treatment residue will be drawn for waste characterization purposes (waste characterization samples will not be released for laboratory analysis until agent analysis results confirm that the agent concentrations are below the approved level). The neutralization station operator will close the bung into the liquid hazardous waste drum and clean any material from the top of the drum.

The drum opening in the neutralization station will then be covered with a metal cover to maintain the engineering controls within the glovebox while the liquid hazardous waste drum is removed from underneath the neutralization station. To begin liquid hazardous waste drum removal, the inside operator will lower the drum in the waste containerization system and remove it from the operations trailer as described in the section "Removing the Hazardous Waste Drums." The outside operators will then move the liquid hazardous waste drum to temporary storage.

If the chemical agent analytical results indicate that chemical agents were detected, the liquid hazardous waste drum will be returned to the glovebox. Additional amounts of the appropriate treatment reagent will be added to the waste drum, mechanically stirred, and allowed to react. A representative sample of the waste will be withdrawn to confirm that the agent content is below the approved levels. The drum will be sealed and returned to temporary storage.

Once agent analysis indicates an agent concentration below approved levels, the liquid hazardous waste drum will be prepared for transport to an approved hazardous waste TSDF. As in the liquid waste drum procedures, the solid waste drum will be removed from engineering controls. A representative sample of the solid waste drum will be sent for confirmation of achieving the approved treatment level.

BLUE Process. The BLUE process will treat only neat H agent contained in bottles found in K941 and K942 CAIS. The reagent in the BLUE treatment process will be DCDMH and a solvent mixture of 48.5 percent $CHCl_3$/48.5 percent t-butyl alcohol/3 percent water.

The BLUE process differs from the RED and CHARCOAL processes only in the chemical agent treated and the amount of treatment reagents used. Premeasured containers of solvent and DCDMH reagent will be required for the BLUE process. The DCDMH will be tested for available chlorine every six months. The operator will verify that the DCDMH is in date before use. The solvents do not have a shelf life and, therefore, do not require dates.

The DCDMH will be tested for available chlorine every six months. The operator will verify that the DCDMH is in date before use. The solvents do not have a shelf life and, therefore, do not require dates.

CHARCOAL Process. Chemical agents adsorbed onto charcoal will be separated into two processes: a CHARCOAL process and a CHARCOAL-L process. The charcoal-containing CAIS bottles contain 3 ounces (90 cubic centimeters) of activated charcoal onto which 25 mL of neat chemical agent or industrial chemical are adsorbed. For neutralization involving charcoal-containing CAIS bottles, only one bottle will be processed in the reactor per batch. The CHARCOAL process will treat H and HN adsorbed onto charcoal. The treatment reagent for the CHARCOAL process will be DCDMH in $CHCI_3$ solvent.

The DCDMH will be premeasured and packaged in suitable containers. The CHARCOAL-L process will treat L agents adsorbed onto charcoal. The treatment reagent for the CHARCOAL-L process will be DCDMH in a mixture of $CHCI_3$/t-butyl alcohol/water. The DCDMH and solvent are premeasured (one jar of DCDMH, one can of solvent. The DCDMH will be tested for available chlorine every six months. The operator will verify that the DCDMH is in date before use. The solvents do not have a shelf life and, therefore, do not require dates.

The required equipment and process description for the CHARCOAL processes will be the same as the RED process, with the exception of the treatment reagents and the color-coded holding cans. CHARCOAL-L and CHARCOAL reaction products may be combined in the CHARCOAL drums.

Removing the Hazardous Waste Drums. The liquid hazardous waste drum is a 30-gallon phenolic/epoxy-lined steel drum with a closed head. A 2-inch bung and a 3/4-inch bung are located on the edges of the drum, 180 degrees opposed. The drum meets all applicable Department of Transportation (DOT) standards. The liquid hazardous waste drum will contain less than 20 percent by volume of solid material, therefore the drum will be managed as liquid waste. Approximately 30 liquid hazardous waste drums are expected to be required to complete Rapid Response System operations; however, the actual quantity of waste will be dependent upon the amount of chemical agent contained in the PIGs.

The waste drum for solids is also a 30-gallon phenolic/epoxy-lined steel drum but with an open head. This drum also meets all applicable DOT standards. Approximately 60 drums for solids are expected to be required for completion of Rapid Response System treatment operations; however, the actual quantity of waste will be dependent upon the conditions of the contents.

A metal cover will be provided in the glovebox to cover each waste drum opening. These covers will protect the drums and their contents while not being used. The cover for each drum opening will be heavy enough to overcome the tendency of the lid to lift due to the vacuum caused by the induced draft filter fan, but not so heavy that an operator cannot remove it manually at arm's length.

The waste containerization system is considered a 90-day storage area and will be managed accordingly. The drums will remain closed when waste is not being added, removed, or sampled. In addition, the waste containerization system is under the environmental controls of the glovebox. Any vapor emissions from the drums will be captured by the glovebox air filtration system.

Removing the drums from under the neutralization and unpack stations may be accomplished when a particular treatment process has been completed or when the drums are full.

To remove the drums, the waste containerization lifting system will be used to lower the drum. An industrial forklift or similar device will be moved into position to lift each waste drum from its drum drawer. The outside operators will carefully slide the drawer containing the waste drum out of the glovebox. The lifting device will then be correctly positioned, and the drum sling attached to the liquid hazardous waste drum or hazardous waste solids drum. The drum will then be hoisted up out of the sliding drawer, moved away from the drawer, and either lowered to the ground or onto a cart or handcart for transfer to storage.

Temporary Waste Staging Area. The hazardous waste staging area (northeast ventilated vault) will be used to support the operations of the Rapid Response System. The waste staging area will allow for the accumulation of containerized treatment residues and Rapid Response System-related wastes in a controlled manner until the wastes are shipped to an approved hazardous waste TSDF. The staging area will be used to provisionally store these wastes for a period of time that, in all cases, will be less than 90 days. This 90-day period will begin when waste is first entered into the drum. All waste containers will be labeled appropriately, to include the date of generation. It is understood that no waste container will be allowed to remain in the staging area for a period of time that is 90 days or longer from the generation date on each drum label. For this reason, the staging area is not required to be permitted, and will not be considered a permitted area for the purposes of the Rapid Response System.

The staging area will be inspected at least weekly. All containers in the area will be inspected to ensure proper sealing, labeling, and that containers are of sound integrity. In addition, the spill kit will be inspected to ensure that it is stocked at all times. Inspection schedules are in Attachment 6.

Waste containers that contain free liquids will be placed on spill pallets to allow for the containment of a drum and its contents should a leak occur.

If it is determined that a container of waste must be opened for any reason other than sampling or adding to the contents, the container will be returned to the engineering controls of the Rapid Response System glovebox system. While it is not anticipated that waste containers stored in the 90-day storage vault will be opened for the purpose of adding to the contents, the general requirements of 40 CFR 262.34 allow for this contingency.

As previously indicated, any identified waste spill in the waste staging area will be remediated and containerized immediately. Containerized spill cleanup materials will also be staged in the waste staging area until pickup for offsite treatment and disposal.

Prior to waste pickup, an inspection of all containers in the staging area will be conducted to ensure that all containers are structurally sound and are properly labeled prior to being offered up for transportation. Prior to signing the manifest, the generator or a designee will ensure that drum counts, packaging, and labels are consistent with information found on the completed manifests. When the manifest is signed, waste custody is transferred to the hauler.

Non-routine Operations. Non-routine operations will be defined as:

- A leaker or spill encountered in the glovebox during routine operations. The leaker or spill will be kept under the negative pressure of the glovebox.

- Unusual occurrences, other than a spill or leak, that cause a suspension of routine operations to perform another task.

Non-routine operations are not initially considered emergency situations. Non-routine operations, while not performed on a regular basis, are expected, and have design features built into the Rapid Response System to accommodate them.

- *Suspected Leak.* Glovebox operators will be alert for signs of a suspected leak, such as clumping of absorbent, the presence of wet packing material, or broken glass. A suspected leak will most likely be initially identified during unpack operations in the unpack station but could occur within the airlock or neutralization station. Whether identified upon cutting open the PIG, removing the glass ampules or bottles from the packing materials, or during another sub-operation, the non-routine actions and procedures will be similar. The suspected leak and associated materials will be (1) contained by the existing catch tray, (2) separated from uncontaminated CAIS materiel, (3) monitored and identified [see Attachment 2-2a(3)b], (4) treated to reduce the chemical agent properties, and (5) disposed of in the appropriate waste drum.

All unpack operations will be conducted over a catch tray to facilitate containment of any spilled material or loose packing material. Upon detection of a spill, the material must be contained in the catch tray and monitoring procedures must be initiated to determine the identity of the leaked materiel. The basic assumptions used in the monitoring strategy for confirming suspected leaks are that:

- The type of CAIS ampule or bottle the suspected leak or spill originated from is known;

- Industrial chemicals with the military symbols chloroacetophenone (CN), adamsite (DM), and tabun (GA) simulant cannot be monitored (other than by visual observation) because their vapor pressures are too low; and

- Vapors from CN, DM, and GA simulant, if any, will not interfere with the monitoring equipment used.

The initial step when discovering a leak of CAIS materiel is to contain the spill. This will eliminate further spreading of CAIS contamination.

The next step is to identify the leaking materiel using the appropriate gross-level detector. If the suspected leak is from a known or marked container, the operator will first use the appropriate colorimetric tube to identify the chemical agent. If the suspected leak is unknown, the operator will use several colorimetric tubes in sequence to identify the unknown material. Table 2-3 lists the colorimetric tubes used for this detection.

Process of elimination will be used to narrow the possibilities of the content of the suspected leak. Familiarity with how the CAIS items were packaged and what is being unpacked assists in eliminating certain chemical agents or industrial chemicals from the list of suspects. Knowledge of whether the glass container is a bottle or an ampule, a bottle with charcoal, a bottle with a solid, etc., plays a part in confirming and identifying a suspected leak. As a result, unpacking operations should continue until the glovebox operator can determine if bottles or ampules are being unpacked. The identified intact CAIS materiel will be set aside in the appropriate color-coded holding can in the unpack or airlock stations.

Table 2-3.
Colorimetric Gas Detection Tubes

CAIS Materiel	Colorimetric Tube	Range
Mustard (sulfur and nitrogen)(H, HN)	Draeger CH 25803 HD or equivalent Draeger CH 25903 HN or equivalent	1.0 $mg/m^3$1.0 mg/m^3(qualitative)
Lewisite (L)	Draeger CH 26303 or equivalent	3.0 mg/m^3(qualitative)
Chloropicrin(PS)	Enmet 90172-000 or equivalent	0.1 to 15 ppmv(0.1 ppmv = 1.0 TWA)
Cyanogen Chloride(CK)	Draeger CH 19801 or equivalent	0.25 to 5 ppmv(0.3 ppmv = 1.0 TWA)
Phosgene(CG)	Draeger CH 19401 or equivalent	0.02 to 0.6 ppmv(0.1 ppmv = 1.0 TWA)
Chloroform ($CHCl_3$)	Draeger CH 2886 or equivalent	2 to 10 ppmv(10 ppmv = 1.0 TWA)

CAIS material and glovebox surfaces contaminated with chemical agent will be decontaminated with either DCDMH in $CHCI_3$/t-butyl alcohol/water solution or 5 percent sodium hypochlorite solution. The DCDMH co-solvent solution will be used for treating agent-contaminated vermiculite or similar packing materials. Five percent sodium hypochlorite will be used to decontaminate metal and glass surfaces, smooth surfaces, sawdust, and cardboard. In either case, the decontamination operation is concluded by rinsing the glovebox surface with water, to which has been added a trace of detergent, and the surface is allowed to dry. A representative sample is collected and sent to the MASP to check the effectiveness of the decontamination operation.

Sodium hypochlorite is normally purchased from commercial sources in 1 gallon and 2.5 gallon jugs. It is normally applied with a squeeze bottle, disposable wipes, or with a brush. Vermiculite is decontaminated by adding RED process cosolvent and DCDMH to the contaminated vermiculite, until the vermiculite is thoroughly wetted. The mixture is then stirred. Upon completion of the process the mixture is poured into a waste drum and the drum covered as quickly as practical to limit release of CHCI3 into the filter system. Operators will avoid directly wetting gloves with the solution because of its $CHCI_3$ content.

Large amounts of contaminated vermiculite, for example, the entire volume within a PIG, may require several gallons of the DCDMH solution. This solution will be mixed as described above. The contaminated vermiculite may be decontaminated in the glovebox in a pail with a capacity of five gallons or less. DCDMH solutions will not be prepared in large quantities to use for this contingency as the solution has a limited shelf life. It will be mixed as needed. Should any DCDMH solution exceed the shelf life, it will be disposed of as hazardous waste.

CAIS material contaminated with industrial chemicals will be placed in the solids drum without further treatment. Glovebox surfaces contaminated with industrial chemicals will be wiped clean with disposable wipes moistened with water, to which may have been added a trace of detergent, and allowed to air dry.

The Rapid Response System Site Supervisor will determine if the reactor, a catch tray, the solids drum, a pail, or a combination of these means will be used for decontamination. Broken glass from an ampule or bottle, and small pieces of packing material (capable of fitting into the liquid waste drums, through the funnel) contaminated with chemical agent may be decontaminated in the reactor. PIG pieces will be thoroughly decontaminated and rinsed with water. Large quantities of agent-contaminated packing material may have to be treated in the solids drum, which will be under engineering control in the glovebox system. Any contamination from industrial chemicals need not be treated but will be directly loaded into the solids drum. A leak of both chemical agent and industrial chemicals will be treated as chemical agent.

The system operator will unload the PIG very slowly, putting all contaminated pieces of glass and packing material into the catch tray. Clumped packing material will be broken up, if possible. The material will be placed in the reactor for treatment (if feasible) and covered with the appropriate decontamination solution. The reactor lid will be secured, and the mixture will be agitated allowing the reaction to continue for 15 minutes; then the mixture will be poured into a waste drum. DCDMH solutions will normally be poured into the liquid waste drum; 5 percent sodium hypochlorite treated wastes will normally be disposed of in the solids drum. This should avoid a two phase waste in the liquid waste drum. Each load decontaminated in the reactor will undergo this process. If the quantity of contaminated material requires treatment in the drum, the material will be treated with the appropriate decontamination solutions, agitated for one minute, then covered and allowed to stand for 15 minutes.

The catch tray will be thoroughly wiped with a decontamination solution and rinsed.

After unloading a PIG containing leaked CAIS materiel, the operator will also discard the PIG into the hazardous waste solids drum. A long PIG (38 to 42 inches) will be decontaminated and then cut with the PIG cutter (unless previously cut) to enable all parts of the PIG to fit into the solids drum. Short PIGS will be decontaminated and discarded without being cut by the PIG cutter unless they were previously cut to gain entrance to the PIG. In addition, the inside of the catch tray and surrounding area will be wiped down with decontamination solution to ensure that the entire area outside the catch tray is decontaminated. All wipes used to absorb liquid will be soaked in decontamination solution, using a separate container, for at least 15 minutes before being placed in the solids drum. An absorbent wipe with decontamination solution will be used to wipe the area. After 15 minutes (minimum), the area will be wiped and rinsed a second time with water to remove any additional residue. A small amount of detergent may be added to the rinse water to provide surfactant properties.

After decontamination operations have been completed, final monitoring of the unpack station will be performed to ensure that the decontamination procedures have been effective. For chemical agents, colorimetric tubes (as shown in Table 2-3) will be used first. After negative results have been obtained for gross levels of chemical agent vapors, MINICAMS® will be used to confirm the absence of low-levels of vapors for the chemical agent in question. For industrial chemicals, only colorimetric tubes will be used; MINICAMS® will not be required. If positive results are obtained from gross-level monitoring with colorimetric tubes, the decontamination procedures will be repeated until acceptable results are obtained. Section 2-2a(3) contains more detailed information concerning monitoring procedures.

- *Spills.* Spills will be handled in a manner similar to suspected leaks. Catch trays are employed to contain spills, and absorbent wipes will be used to absorb freestanding liquid and control the spread of contamination. Once used, these wipes will be soaked in decontamination solution for a minimum of 15 minutes in a separate container before being disposed of in the solids drum. Spills outside of engineering controls will follow the contingency procedures provided in Section G of this permit application.

- *Change-out of Carbon Filter Elements.* This operation will be part of the scheduled maintenance and service operations performed on the Rapid Response System. Filter change may be required if $CHCI_3$ or CAIS materiel is detected between the filter elements. The initial alarm indicating filter breakthrough will come from one of two locations: between the coconut shell carbon filter elements for $CHCI_3$ or between the ASZM-TEDA carbon filter elements for chemical agent. Alarms between the ASZM-TEDA carbon filter elements will be confirmed by DAAMS. Colorimetric tubes will be used to confirm industrial chemical alarms. The Rapid Response System Site Supervisor maintains authority to exchange filter elements when deemed appropriate.

Coconut Carbon filter elements will be changed after two days during the conduct of treatment operations using $CHCI_3$, or if clean-ups of a leak or spill may have released $CHCI_3$. Normal operations will be suspended during change-out. The carbon filter system will be changed out using a bag-in bag-out procedure. When standing outside and facing the front of the operations trailer, the prefilter, first HEPA filter, and coconut shell carbon filters will be removed from the left side of the trailer. The ASZM-TEDA carbon filters will be removed from the front of the trailer; and the second HEPA filter will be removed from the right side of the trailer. The carbon filters will be changed out by bagging them, removing them from the filter housing, and containing them in an appropriate size container. More information on the monitoring and disposition of the carbon filters can be found in the Rapid Response System Hazardous Waste Management Plan.

Unexpected Operations. Items or materiel may occasionally be encountered that do not appear to be components of CAIS. Such items or materiel could include glass bottles or ampules of unexpected configurations. In the event such items are encountered, the items or materiel will be (1) photographed; (2) nonintrusively identified by the Raman, if possible; and (3) if the items or materials are identified as industrial chemicals, they will be repackaged and sent offsite; CAIS-type chemical agent may be treated in the reactor. A Field Procedure Team will determine the appropriate disposition of the unexpected materiel. Based upon that determination, the unexpected item will be held in the glovebox or returned to permitted storage. Unidentified items will not be held in the glovebox for more than seventy-two hours without direction from the Field Procedures Team and the approval of the Executive Secretary. UDSHW will be notified when such items or materiel are encountered, and will receive information copies of all notes, messages, and reports.

In addition, the Army is interested in examining actual CAIS items in order to improve the Rapid Response System treatment process. At the discretion of the Rapid Response System Test Director and subject to the approval of the Division of Solid and Hazardous Waste, some CAIS items may be repacked for return to storage and ultimate return to Edgewood Research, Development and Engineering Center (ERDEC) for study. These CAIS items will be transported under technical escort to ERDEC, located in Aberdeen, Maryland.

2-2a(3) Monitoring Procedures

During normal glovebox operations, the system operators will always be present. The operators will conduct and visually monitor the treatment process and will therefore be able to respond immediately in the event of a malfunction, spill, or other non-routine incident. Monitoring of treatment activities will also include verifying treatment effectiveness using different monitoring instruments and procedures.

Monitoring procedures during Rapid Response System operations will be of two types:

a. *Near Real-Time Air Monitoring.* MINICAMS® will be used to monitor the workspace inside the Rapid Response System operations trailer, the workspace inside the MASP, and between the filter elements of each carbon filter type on a near real-time (NRT) basis. Also, the carbon filter system exhaust will be monitored with MINICAMS® in the event the MINICAMS® detect HD, HN, L, PS, cyanogen chloride (CK), or phosgene (CG) between the ASZM-TEDA filter elements. The interior of the glovebox will be monitored with MINICAMS® on an NRT basis when necessary. NRT low level monitoring for $CHCl_3$ in the vault used for temporary waste storage in Building 4553, will be done constantly. This monitoring will use commercially available equipment.

   The MINICAMS® monitoring the workspace inside the operations trailer and between the filter elements of the carbon filter system will be set to alarm at 20 percent of the Chemical Control Limit (CCL) for H, HD, HN-1, and HN-3, 50 percent of the CCL for L, and 70 percent of the time-weighted average (TWA) hazard level for CK, CG, PS, and $CHCl_3$.

   The MINICAMS® will alternately sample between the workspace within the operations trailer and the carbon filter system. These sample points will be required to be online prior to any chemical materiel operations being performed inside the glovebox. They are required to stay online until all CAIS ampules and bottles are properly stowed and any spill components and surrounding areas are cleaned and cleared as described in Section 2-2(a)2.

   The MINICAMS® will also be used as needed to verify that the glovebox has been decontaminated. The inside of the glovebox will be monitored with the MINICAMS® glovebox sampling wand whenever verification of decontamination is necessary and as deemed appropriate by the Rapid Response System Site Supervisor.

b. *Confirmation Air Monitoring.* Confirmation air monitoring systems do not provide immediate warning of hazardous conditions, but will be used to document conditions over time or to confirm a hazard indicated by the MINICAMS®.

   MINICAMS® alarms for H, HD, HN-1, HN-3, and L at the CCL level will be confirmed by the DAAMS. Confirmation monitors will be located between the ASZM-TEDA carbon filter elements, inside the operations trailer workspace, inside the operations trailer glovebox, and at the air filtration system outlet. Confirmation air samples will be collected and analyzed onsite by the MASP personnel.

   MINICAMS® alarms for PS, CG, CK, and $CHCl_3$ will be confirmed at the TWA level with colorimetric tubes. Confirmation methods will be used to monitor between each set of carbon filter elements, workspace, glovebox, and the exhaust at the end of the glovebox filter system.

   DAAMS samples will be collected between the ASZM-TEDA carbon filter elements, carbon filter exhausts for the operations trailer and the MASP, and inside the operations trailer and MASP workspace. DAAMS samples inside the operations trailer glovebox will be collected, if required. In the event of a release or loss of engineering control, DAAMS tubes will analyzed for agent concentration.

Table 2-4 lists the type of monitor to be used during Rapid Response System operations, the location of the monitor, the type of chemical materiel being monitored, and the frequency of the monitoring procedure. Appendix 2-3 provides detailed information on the operation of the monitoring equipment.

On the first operational day of each week of Rapid Response System site operations, all MINICAMS® will be calibrated and challenged. At the beginning of all subsequent operational days of each week, every MINICAMS® will be challenged at the 1.0 CCL or TWA hazard level. The Site-Specific Laboratory Quality Control Plan for the Rapid Response System Test at Deseret Chemical Depot contains detailed information on calibration procedures for the MINICAMS®. A diagram of the monitoring system layout is included in the engineering design package for the Rapid Response System as drawing number AE95-RRS-810-01.

- *Monitoring of Spills During Unpack Operations.* In the event that liquid or evidence of broken CAIS items (such as hairline fractures on ampules and bottles or broken glass) is found inside a PIG or other type of overpack during unpack operations. The identity of the chemical materiel or industrial chemical will be established with appropriate colorimetric tubes. In the case of K951, K952, K953, and K954 CAIS, colorimetric tubes sensitive to TWA levels of volatile $CHCI_3$ may be used to infer the presence of $CHCI_3$ solutions of H, HD, HN-1, L, and PS leaking from ampules. If $CHCI_3$ is detected, the leaking chemical materiel or industrial chemical will be identified with a second, more specific colorimetric tube. Because of their low vapor pressures, the industrial chemicals CN, DM, and GA simulant resist detection with colorimetric tubes. Spills of all hazardous waste materials will be cleaned up immediately.

  Colorimetric tubes used for air sampling inside the glovebox will be deposited inside the solids drum. Once identified, the chemical materiel or industrial chemical spill components and surrounding area will be cleaned up as described in Section 2-2a(2).

- *Glovebox Decontamination Monitoring.* The interior of the glovebox will be decontaminated when necessary or deemed appropriate by the Rapid Response System Site Supervisor. The glovebox stations will be decontaminated with 5 percent sodium hypochlorite solution applied with squeeze bottles or spread with disposable wipes or brushes (as appropriate), rinsed with detergent/water solution, and allowed to air-dry. All water rinses will contain a minimal amount of liquid dishwashing detergent to provide surfactant action to enhance the effectiveness of the water rinse.

Upon completing initial decontamination procedures, the interior of the glovebox will be surveyed with colorimetric tubes appropriate to the chemicals last detected. If contamination is detected, the glovebox will be decontaminated again as previously described, and monitored again for the detected chemical materiel. When colorimetric tubes no longer indicate the presence of HD, H, HN-1, HN-3, or L vapors, Rapid Response System personnel will sample the glovebox with the MINICAMS®. If the MINICAMS® readings are below 1.0 CCL, the glovebox is declared successfully decontaminated.

- *Operations Trailer Workspace Alarm and Loss of Engineering Controls.* If a MINICAMS® alarms indicating a concentration of chemical agent or selected industrial chemical above the CCL or TWA in the workspace area, and there is a loss of negative pressure in the glovebox system, all operators don their escape masks and evacuate the operations trailer immediately. This alarm also sounds outside the operations trailer to alert outside personnel to don their respiration protection.

  Upon the onset of the alarm, all personnel in the operations trailer will stop work, don their escape masks, and evacuate the operations trailer. Personnel evacuating the operations trailer will report to the emergency personnel decontamination station (EPDS) for further instructions. The Rapid Response System Site Supervisor will account for the presence and safety of the Rapid Response System operators and will notify the Deseret Chemical Depot Emergency Operations Center if a chemical agent is released outside the engineering controls of the glovebox.

  The Rapid Response System Site Supervisor will survey the situation, develop an emergency response plan to determine the source of the alarm, select the emergency response team, and brief Rapid Response System personnel on the emergency response plan. Personnel re-entering the operations trailer will don the appropriate level of Occupational Safety and Health Administration (OSHA) personal protective clothing and respiratory equipment. The emergency response team will determine the reason for loss of negative pressure within the glovebox, perform confirmation monitoring, and collect DAAMS tubes for confirmation samples. If the MINICAMS® has alarmed for the industrial chemicals PS, CG, CK, or $CHCl_3$, the appropriate colorimetric tube will be used to confirm the alarm. Colorimetric tubes will also be used to perform gross-level monitoring for the chemical agents HD, HN, and L. Colorimetric tubes will be used over the suspected location, if known, at breathing and floor levels. If the alarming substance is the chemical agent HD, HN, or L, the DAAMS tubes will also be collected and exchanged as confirmation samples. Rapid Response System personnel will not delay emergency operations during DAAMS tubes analysis, and continue with their response procedures. The DAAMS tubes will be collected, logged, and forwarded to the MASP for analysis.

Table 2-4.
Chemical Materiel Monitors

		LOCATION				
Type	**Chemical Materiel**	**Operations Trailer and MASP Workspace**	**Coconut Shell Carbon Filter Midbed**	**ASZM-TEDA Carbon Filter Midbed**	**Operations Trailer and MASP Filter System Exhaust**	**Interior Gloveboxes and Waste Drum**
MINICAMS®	H	Cyclic		Cyclic	Optional (on-call)	When required
	HN	Cyclic		Cyclic	Optional (on-call)	When required
	L	Cyclic		Cyclic	Optional (on-call)	When required
	$CHCl_3$	Cyclic	Cyclic		Optional (on-call)	When required
	CK, CG, PS	Cyclic		Cyclic	Optional (on-call)	When required
CONFIRMATION DAAMS	H	On demand		On demand	On demand	
	L	On demand		On demand	On demand	
	HN	On demand		On demand	On demand	
HISTORICAL DAAMS	H	Operational Hours			Operational Hours	Optional (on-call)
	L	Operational Hours			Operational Hours	Optional (on-call)
	HN	Operational Hours			Operational Hours	Optional (on-call)
Colorimetric Tube	$CHCl_3$	When required	When required		When required (on-call)	When required
	H, HN	When required				When required
	L	When required				When required
	CG	When required		When required	When required	When required
	CK	When required		When required	When required	When required
	PS	When required		When required	When required	When required

Notes: *On demand* refers to when DAAMS tubes are needed to confirm MINICAMS alarms (0.2 CCL for mustard; 0.5 CCL for Lewisite).
When required refers to when colorimetric tubes are needed for MINICAMS confirmation.

- *Operations Trailer Workspace Alarm With No Loss of Engineering Control.* If a MINICAMS® alarms indicating a concentration of chemical agent or selected industrial chemical above the CCL or TWA, Rapid Response System personnel will immediately don escape masks, evacuate the operations trailer, and then confirmation monitoring will be performed. This alarm will also sound outside the operations trailer to alert personnel to don their respiratory protection mask and report to the EPDS. One system operator and one MINICAMS® monitoring specialist may remain in the operations trailer wearing the escape mask to determine the cause of the alarm. The operators will not remain in the operations trailer for any longer than one complete MINICAMS® cycle following the alarm.

  The Rapid Response System Site Supervisor will select an emergency response team to re-enter the operations trailer dressed in OSHA Level B with self-contained breathing apparatus to perform confirmation monitoring.

  If the MINICAMS® alarm is for PS, CG, CK, or $CHCI_3$, the appropriate colorimetric tube will be used to confirm the MINICAMS® reading. If the MINICAMS® alarm is for HD, HN-1, HN-3, or L, the appropriate DAAMS sample will be sent to the MASP for immediate analysis.

  In the event that MINICAMS® alarms continue and confirmation samples do not confirm the presence of chemical materiel, operations will stop until the MINICAMS® is repaired or the source of the problem is identified and corrected.

- *Carbon Filter Alarms.* If MINICAMS® alarms indicate the breakthrough of chemicals between the dual carbon filter elements, confirmation air samples will be collected by Rapid Response System crew and analyzed by the MASP. Operations will proceed to complete the process already ongoing in the glovebox. Appropriate carbon filter elements will be changed.

- *Positive Reading at the Carbon Filter Exhaust of the Operations Trailer.* If chemical levels exceeding the CCL or TWA are detected at the carbon filter exhaust, all treatment operations will immediately stop and all Rapid Response System personnel will don escape masks and evacuate. The monitoring event will be confirmed, all filter elements exchanged, re-monitoring will occur, and area decontamination will be conducted as appropriate.

- *MASP Trailer Workspace and Loss of Engineering Controls.* In the event of a release of agent vapor or liquid in the MASP workspace, personnel shall mask and evacuate the MASP immediately. The filter for the MASP will continue to operate and operations in the MASP will not be restarted until monitoring with DAAMS has confirmed that the workspace is free of chemical agent. In the event of loss of engineering controls in the MASP, personnel will immediately don protective masks, cease all operations, and evacuate the MASP. The MASP filters shall be changed and the workspace will be monitored with DAAMS tubes. Once engineering controls have been reestablished and monitoring with DAAMS have confirmed that the workspace is free of chemical agent, operations in the MASP may continue.

Reactor Temperature and Pressure Monitoring. During the Rapid Response System Test, one sensor will be located on the reactor in the neutralization station to measure the pressure of the treatment reaction. This information will be collected electronically for the test. A rupture disk is installed in the reactor to prevent reactor expansion. A thermometer is also affixed to the reactor to let the operator confirm that the reactor is cool enough to handle.

Differential Pressure Monitoring. A pressure sensor will be located on the glovebox to display the negative pressure in the glovebox at the unpack station relative to the trailer workspace. The speed of the filter exhaust fan is automatically controlled to maintain the proper negative pressure at the unpack station as detected by a pressure sensor. Department of Defense (DoD) regulations require that this pressure be kept at 0.25-inch water column negative pressure as a minimum. The actual operating pressure will be set at the optimum level for the equipment, including known upsets such as changing drums, changing gloves, and opening the airlock door. The optimum level of negative pressure to be maintained in the glovebox was determined during Rapid Response System acceptance testing (Spring, 1996). Reduction of negative pressure will activate a local alarm indicating that the glovebox negative pressure is below acceptable limits. Pressure sensors will be located at the HEPA filters to monitor filter performance. Loss of pressure differential, or excessive differential, will trigger an alarm to warn operators that corrective action is required.

2-2a(4) Inspection

The inspection requirements and schedules for the glovebox are in Attachment 6 of the permit.

2-2a(5) Closure

Closure of the glovebox is addressed in Module II.J of the permit.

2-2a(6) Mitigative Design and Operating Standards

Treatment processes will be conducted inside the confinement of the glovebox, which will be inside the operations trailer inside Building 4553, Deseret Chemical Depot. The glovebox has been designed and constructed to prevent releases of CAIS materiel into the operations trailer; ventilation air from the exhaust will be filtered and monitored. The glovebox will be located indoors and protected from precipitation, thus precluding precipitation run-on and contaminated run-off. The glovebox will be mounted on support stands, which will be secured to the floor. The glovebox will not contain drains. Gloveports, a sealable door transfer system, and the drum openings will be sealed or otherwise secured to prevent leakage and maintain proper air flow (negative pressure in the glovebox relative to the operations trailer workspace).

The negative pressure differential between the glovebox and the operations trailer will be the primary indicator of the adequacy of glovebox confinement. The differential in negative pressure will be monitored and displayed on a gauge in the workspace. An alarm will activate if the change in negative pressure varies from the established operating range. To minimize the chance of air emissions, the ventilation exhaust from the glovebox will pass through redundant HEPA and carbon filters prior to being exhausted.

All Rapid Response System trailers are equipped with CO_2 ABC-type fire extinguishers.

Glovebox operators will manually control treatment activities from outside the glovebox through gloveports, thus preventing worker exposure to hazardous chemicals during a treatment process.

Operating standards include:

- Conducting treatment according to compatible content codes (color-coded holding cans)
- Preoperational checks prior to treatment operations
- Neutralization station cleanout after all ampules or bottles of a process (RED, BLUE, CHARCOAL, or CHARCOAL L) have been treated
- Glovebox operators trained and qualified to conduct routine treatment processes and emergency procedures
- MINICAMS® monitoring the workspace within the operations trailer and between the carbon filters. The MINICAMS® will also monitor inside the glovebox on an as-needed basis. Glovebox monitoring will usually occur one station at a time. The monitors will be able to detect airborne vapors escaping from the glovebox that would indicate glovebox confinement failure or problems with the carbon filter system.
- DAAMS monitoring the workspace within the MASP trailer. The monitors will be able to detect airborne vapors escaping from releases in the workspace.

2-2b Environmental Performance Standards for Miscellaneous Units [40 CFR 264.601 and 270.23(c); R315-8-16 and R315-3-6(a)(8)]

2-2b(1) Miscellaneous Unit Wastes [40 CFR 264.601(a)(1), 264.601(b)(1), and 264.601 (c)(1)]

The wastes to be treated inside the glovebox will be the same as those described in Attachment 4-1. The specific waste characteristics that will require treatment are also described in Attachment 4-1.

2-2b(2) Containment System [40 CFR 264.601 (b)(2) and 270.23(a)(2)]

Reactor. The treatment of CAIS chemical agents will occur in a reactor within the neutralization station of the glovebox. The reactor will be located in a catch tray on the bottom of the neutralization station. This catch tray will serve as secondary containment for all liquids contained in the reactor. The structure of the neutralization station of the glovebox will provide tertiary containment for the reactor. The neutralization station of the glovebox is constructed of 11 gauge type 316L stainless steel that is compatible with all liquids to be treated within the glovebox. The neutralization station is free of any cracks or gaps. The glovebox is supported by a frame constructed of carbon steel square tubing American Society for Testing and Materials-A500 painted with chemical resistant epoxy paint. The glovebox frame is of welded construction.

The neutralization station of the glovebox is designed to contain approximately 7 gallons. The reactor is designed to hold 1 gallon (nominal).

Containment area size =

(60" x 31" x 1") - (P x 9.25^2) = 1591 in^3

1591 in^3/1728 in^3 per ft^3 = 0.921 ft^3

0.921 ft^3 x 7.481 gallons per ft^3 = 6.89 gallons capacity

Volume occupied by reactor in neutralization station =

Π x $(4.156")^2$ x 1" = 54.3 in^3 = 0.24 gal

Capacity of neutralization station with reactor in place =

6.89 gal - 0.24 gal = 6.65 gal

Any spills occurring within the neutralization station of the glovebox will be cleaned up at the time of occurrence. The most likely source of spills in the neutralization station will be from dropping ampules or bottles, a faulty reactor lid seal, or through functioning of the rupture disk in the event of a pressure excursion. All visible liquid will be absorbed on disposable wipes. The entire neutralization station, including the catch tray, will be wiped down with 5 percent sodium hypochlorite, rinsed with water (to which has been added a few drops of detergent), and allowed to air dry. Materials used for cleanup operations will be disposed of in the hazardous waste solids drum. Leaks or spills within the neutralization station will be handled as a non-routine operation, as described in Section 2-8a(2). These procedures will ensure that the secondary containment of the reactor will not overflow.

Liquid Hazardous Waste Drum. Secondary containment for the liquid hazardous waste drum, where treatment of process neutralents may occur, will be provided by the drum drawer of the waste containerization system. The 1/8 inch thick type 316L stainless steel drum drawer will slide into and out of the glovebox to enable the liquid hazardous waste drum to be removed from the waste containerization system. The stainless steel welded construction of the drum drawer will be compatible with all wastes to be treated in the neutralization station of the glovebox and in the liquid hazardous waste drum.

Each drum drawer of the waste containerization system is designed to contain approximately 32 gallons. The largest liquid hazardous waste drum will contain up to 30 gallons of process neutralent.

Drum drawer size (inside) =

26" (length) x 22" (width) x 13" (height)
Inside capacity = 7436 in^3
7436 in^3/1728 in 3 per ft^3 = 4.303 ft^3
1 ft^3 = 7.481 gallons
4.303 ft^3 x 7.481 gallons = 32.190 gallons total capacity of empty drum drawer

If liquids are detected in the drum drawer, the liquid hazardous waste drum may or may not be removed and the liquid in the drawer will be either pumped out or wiped out as most appropriate.

The reactor will be located inside the neutralization station of the glovebox. The glovebox and associated waste containerization system will be enclosed within Building 4553. The floor of Building 4553 drains into blind sumps that will be pumped dry and decontaminated in the event of a spill. The 24-hour, 25-year storm event analysis results in only 2.64 inches of rain per year. This analysis, coupled with the protection provided by the building and the drainage patterns around the building, will preclude any access of external run-on into the secondary containment systems for the reactor and the liquid hazardous waste and solids drum.

2-2b(3) Prevention of Air Emissions [40 CFR 264.601(c)(2) and 270.23(a)(2)]

Treatment of chemical agents in the glovebox will create vapors. Discharge of these vapors will be prevented by the negative pressure sustained in the glovebox and the carbon filter system at the end of the glovebox.

The filter elements that will compose the carbon filter system in the Operations Trailer will be a prefilter, two HEPA filters, two coconut shell carbon filters specifically for filtering chloroform, and two ASZM-TEDA carbon filters. The entire carbon filter system will be monitored for chloroform between the dual coconut shell carbon beds and for chemical materiel between the dual ASZM-TEDA carbon beds. Monitoring will be accomplished using a set of MINICAMS® that will allow the air to be analyzed for all of the CAIS chemicals simultaneously.

The filter elements in the MASP consist of a combination prefilter/HEPA filter and two separate carbon filters. Monitoring of the MASP filter using DAAMS tubes will collect samples from between the carbon filters.

2-2b(4) Operating Standards [40 CFR 264.601(c)(3) and 270.23(a)(2)]

The following operating standards will be used in conducting all treatment processes:

- All treatment activities will be performed by system operators trained to safely conduct the treatment and to respond to non-routine and emergency incidents. The Rapid Response System operating log will also contain additional information such as start and stop time of key operations, any unusual incidents, the identity of each pig processed, results of the Raman spectrophotometry, etc. The test data collection system will record these and other operating parameters, including the maximum temperature and pressure observed for each reaction.
- All treatment activities will be conducted according to specific treatment procedures.
- Wastes slated for treatment will be identified by markings on the outside of the container or analysis by the Raman spectrophotometer.
- Based on CAIS component identification, the materiel will be segregated into appropriate color-coded holding cans.
- All treatment reagents will be pre-measured offsite and added to the waste in a controlled manner. All additions and mixing will occur per an established procedure to preclude any undesirable reactions.
- Only the treatment chemicals (type and volume) and equipment necessary to conduct a particular process treatment will be introduced into the neutralization station.
- Flow-through ventilation will be provided for the glovebox. The ventilation air will ultimately feed to redundant banks of carbon filters prior to being exhausted.

Using these operating standards will aid in preventing releases of hazardous waste constituents that may have adverse effects on human health or the environment.